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Final Report

EMISSION LINE REGION KINEMATICS IN SELECTED SEYFERT GALAXIES

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FINAL TECHNICAL REPORT  
EMISSION LINE REGION KINEMATICS IN SELECTED SEYFERT GALAXIES

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## FINAL TECHNICAL REPORT

### EMISSION LINE REGION KINEMATICS IN SELECTED SEYFERT GALAXIES

The question of the kinematic state of the emission line regions of active galactic nuclei (AGN) is a fundamental problem which addresses the very nature of these objects. The currently popular model of the energy source of these objects is accretion onto the supermassive black hole which is believed to reside in the nuclear regions of galaxies. If this picture is correct then the emission line gas may be expected to be infalling, and may eventually provide the fuel to power these objects.

It is very difficult to determine the kinematic state of the emission line gas because of the technical problems associated with their small apparent sizes, as seen from the earth. We can only observe the net emission from a large ensemble of clouds, so the emission lines are by necessity composite. In this project, we obtained several very long exposures of NGC 1068, one of the very nearest Seyfert galaxies. Because of its proximity, it is expected to have the best resolved emission line regions as seen from the earth. The  $\text{L}\alpha$  emission line of neutral hydrogen will radiate preferentially in the direction of the central object because of the effects of emission line gas opacity on the transfer of radiation out of the clouds. By obtaining high dispersion observations of Doppler broadening of the line through the small entrance aperture of the IUE we shall be able to determine whether this material is in a state of outflow (expected if explosions power the central engine), inflow (expected for accretion onto a massive black hole), or rotation (expected for gas with significant angular momentum near the central regions of a galaxy). The observations have been obtained. Data

analysis is now underway, along with numerical simulation of the microphysics governing the emission process. The results will be submitted for publication in The Astrophysical Journal.